Docket No. 520.38979CX1
Appln. No. 10/671,608
February 10, 2006

REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. In particular, Applicants are adding new claims 23-26 to the application. These new claims 23-26 are independent claims, and respectively include recitations set forth in claims 9, 11, 19 and 20. Specifically, claims 23 and 24 recite subject matter of claims 9 and 11 in independent form, with the exception that claims 23 and 24 omit recitation of the control frequency range set forth in previously considered claim 1. Claims 25 and 26 in substance recite, in independent form, the subject matter of previously considered claims 19 and 20, respectively.

In light of newly added claims 23-26, Applicants are canceling claims 9, 11, 19 and 20 without prejudice or disclaimer. In addition, Applicants are canceling claims 1-8 and 13-18 without prejudice or disclaimer; and, in light of canceling of, inter alia, claim 1, Applicants are amending dependency of claims 10 and 12.

The undersigned notes with thanks the indicated allowance of claims 21 and 22, in the Office Action mailed November 10, 2005. Applicants are retaining claims 21 and 22 without present amendment thereto, and it is respectfully submitted that claims 21 and 22 should remain allowed.

The objection to claim 10 as being of improper dependent form for failing to further limit the subject matter of a previous claim, the Examiner contending that the specific frequency range, claimed in claim 10, is already required by claim 1, is noted. It is respectfully submitted that this objection is moot, in view of canceling of claim 1 and amendment of claim 10 to be dependent on claim 23, claim 23 not reciting the frequency for cyclic on-off control as in claim 10.

The rejection of claims 11, 19 and 20 under the second paragraph of 35 USC 112, as being indefinite, set forth in Item 3 on pages 2 and 3 of the Office Action mailed November 10, 2005, is noted. Claims 11, 19 and 20 have been cancelled without prejudice or disclaimer, recitations therein being set forth in newly added claims 24 –26, respectively. Moreover, note that claim 24 recites "a" percentage of on-period accounts for 5-60% in a cycle of on-off control of the radio frequency voltage, claim 25 similarly reciting "a" percentage of on-period; and claim 26 recites "a" mixing rate of the adhesive gas to be mixed with the halogen. In view of recitations in claims 24-26 reciting "a" percentage and "a" mixing rate, it is respectfully submitted that any question concerning antecedent basis for "percentage of on-period" and for "mixing rate" is moot.

The rejection of claims 14 and 15 under the judicially created doctrine of obviousness-type double patenting, set forth in Item 4 on pages 3 and 4 of the Office Action mailed November 10, 2005, is noted. It is respectfully submitted that this obviousness-type double patenting rejection is moot, in light of canceling of claims 14 and 15, together with parent independent claim 13.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior art applied by the Examiner in rejecting claims in the Office Action mailed November 10, 2005, that is, the teachings of the U.S. patents to Tomioka, et al., No. 5,897,713, to Ye, et al., No. 6,080,529, and to Mihara, No. 6,020,111, under the provisions of 35 USC 102 and 35 USC 103.

Initially, Applicants again thank the Examiner for allowance of claims 21 and 22.

As for the remaining claims in the application, the Examiner's attention is respectfully directed to the objection to claim 9, and the indication that claim 9 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, set forth in the first paragraph on page 8 of the Office Action mailed November 10, 2005. Claim 23 sets forth the subject matter of previously considered claim 9 in independent form, with the exception that claim 23 omits recitation of the numerical range for the on-off control frequency of the radio frequency bias voltage. Note, in particular, that claim 23 recites that the processing step is divided into plural steps, the net power of the radio frequency power applied to the sample being reduced at least in the last step. It is respectfully submitted that the teachings of the references as applied by the Examiner would have neither disclosed nor would have suggested such surface processing method as in the present claims, including, inter alia, such dividing the processing step into plural steps, and the net power, as in claim 23.

In addition, the statement by the Examiner in the second paragraph on page 8 of the Office Action mailed November 10, 2005, that claims 11, 19 and 20 would be allowable if rewritten to overcome the rejections under the second paragraph of 35 USC 112, and to include all limitations of the base claim and any intervening claims, is noted. Claims 24 and 25 recite subject matter respectively set forth in claims 11 and 19, including wherein the percentage of on-period accounts for 5-60% in a cycle of on-off control of the radio frequency voltage; and claim 26 recites the subject matter in previously considered claim 20, including, inter alia, that the mixing rate of the adhesive gas to be mixed with the halogen gas ranges from 0.5% to 50%. In view of statements made by the Examiner in the second paragraph on page 8 of the

Office Action mailed November 10, 2005, it is respectfully submitted that claims 24-26 should be allowed.

In any event, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such a surface processing method, as in the present claims, including, inter alia, wherein the percentage of on-period accounts for 5-60% in a cycle of on-off control of the radio frequency voltage (note claims 24 and 25); and/or wherein a mixing rate of the adhesive gas to be mixed with the halogen gas ranges from 0.5%-50% (see claim 26).

In addition, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested the other features of the present invention as in the remaining, dependent claims, including (but not limited to), inter alia, the frequency for cyclic on-off control of the radio frequency voltage as in claim 10; and/or the frequency of the radio frequency bias voltage as in claim 12.

According to features of the present invention, including the plural processing steps, with net power of the radio frequency power applied to the sample being reduced at least in the last step; and/or the percentage of on-period in a cycle of on-off control of the radio frequency voltage; and/or mixing rate of the adhesive gas, number of high energy ions are reduced, and reduction of selectivity can be avoided. In addition, sufficient power can be attained, such that etching rate is not reduced, while advantages as compared with continuous application of the radio frequency bias voltage are achieved. Note the paragraph bridging pages 27 and 28 of Applicants' specification. Furthermore, in simultaneous etching in the presence of gate electrodes with different electrical conductivities, surface processing can be

achieved which minimizes the difference in processing shapes, and without passing through the underlying gate oxide film. Thus, the present invention is particularly suitable in processing a device of 1 micron or less, more preferably 0.5 micron or less. Note pages 38 and 39 of Applicants' specification.

Tomioka, et al. discloses a plasma generating apparatus and method, used for the purpose of conducting a process, e.g., for etching or film formation, in, e.g., a semiconductor device manufacturing process. As for the most general description of the plasma generating method in this patent, note column 4, lines 10-25. See also column 3, lines 38-55. Note also column 6, lines 15-20 and 29-39. Attention is also directed to the portions of this reference referred to by the Examiner in the first Item 6, on pages 4 and 5 of the Office Action mailed November 10, 2005; that is, in columns 7-12.

It is respectfully submitted that Tomioka, et al. would have neither taught nor would have suggested such surface processing method as in the present claims, including, inter alia, the division of the processing step into a plurality of steps, with the power of the radio frequency power applied to the sample being reduced at least in the last step; and/or percentage of on-period in a cycle of on-off control of the radio frequency voltage; and/or mixing rate of the adhesive gas, and other features of the present invention as discussed previously, and advantages of all of these features.

Ye, et al. discloses a method for etching of patterned layers, this method being described most generally at column 3, lines 37-55. See also column 4, lines 56-59. Note also portions of columns 10-12, 16 and 17, referred to by the Examiner in the second Item 6, on pages 5 and 6 of the Office Action mailed November 10, 2005.

As discussed previously, it is respectfully submitted that Ye, et al. would have neither taught nor would have suggested features of the present invention as discussed previously, including, inter alia, the dividing of the processing step, and/or percentage of on-period in a cycle of on-off control of the radio frequency voltage, and/or mixing rate of the adhesive gas, and/or other features of the present invention, and advantages thereof.

It is respectfully submitted that the additional teachings Mihara would not have rectified the deficiencies of either of Tomioka, et al. and Ye, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Mihara discloses a method of manufacturing a semiconductor device, including a process of patterning a lamination of a silicon film and a metal film formed thereon, the method being described most generally in the paragraph bridging columns 1 and 2 of this patent. Note also column 2, lines 7-10; and column 3, lines 35-51. See also the paragraph bridging columns 5 and 6 of Mihara.

Even assuming, arguendo, that the teachings of Mihara were properly combinable with the teachings of Tomioka, et al. or Ye, et al., it is respectfully submitted that such combined teachings would have neither disclosed nor would have suggested the presently claimed subject matter, including features discussed previously (e.g., the dividing of the processing into steps, with net power of the radio frequency power applied to the sample being reduced at least in the last step; and/or percentage of on-period in a cycle of on-off control of the radio frequency voltage; and/or mixing rate of the adhesive gas, and/or other features previously discussed), and advantages thereof.

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Attention is again directed to the allowable subject matter referred to by the Examiner in the first and second paragraphs on page 8 of the Office Action mailed November 10, 2005. Particularly in view of this indication by the Examiner, it is respectfully submitted that all claims remaining in the application should now be allowed.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently in the application are respectfully requested.

Applicants request any shortage in fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 520.38979CX1), and credit any excess payment of fees to such Deposit Account.

Respectfully submitted,

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